

Problem 1-12

Stoichiometric Table:

Species	I_n (moles/h)	Out (moles/h) \downarrow
$C_2H_3Cl_3$	0.536	$0.536 - \xi_1 (= 0.074)$
H_2	5.357	$5.357 - \xi_1 - \xi_2 - \xi_3$
N_2	47.679	47.679
$C_2H_4Cl_2$	0	$\xi_1 - \xi_2 (= 0.111)$
C_2H_5Cl	0	$\xi_1 - \xi_3 (= 0.050)$
C_2H_6	0	$\xi_3 (= 0.301)$
HCl	0	$\xi_1 + \xi_2 + \xi_3$

ξ_i is extent of Reaction i

Part 1:

Approach - calculate ξ_1 from $C_2H_3Cl_3$ (out); calculate ξ_2 from $C_2H_4Cl_2$ (out); calculate ξ_3 from C_2H_5Cl (out). This value must check the value of calculated from C_2H_6 (out). This value is $\xi_3 = 0.301$

$$\begin{aligned}\xi_1 &= 0.536 - 0.074 = 0.462 \\ \xi_2 &= \xi_1 - 0.111 = 0.462 - 0.111 = 0.351 \\ \xi_3 &= \xi_2 - 0.050 = 0.351 - 0.050 = 0.301\end{aligned}$$

Checks C_2H_6 entry

Part 2: H_2 (out) = $5.357 - (\xi_1 + \xi_2 + \xi_3) = 4.293 \text{ mole/h}$

Part 3: HCl (out) = $\xi_1 + \xi_2 + \xi_3 = 1.117 \text{ mole/h}$